6-04 TIMBER STRUCTURES

6-04.1 Description

This Work is the building of any Structure or parts of Structures (except piling) made of treated timber, untreated timber, or both. The Contractor shall erect timber Structures on prepared foundations. The Structures shall conform to the dimensions, lines, and grades required by the Plans, the Engineer, and these Specifications.

Any part of a timber Structure made of nontimber materials shall comply with the sections of these Specifications that govern those materials.

6-04.2 Materials

Materials shall meet the requirements of the following sections:

Structural Steel and Related Material	9-06
Bolts, Washers, Other Hardware	9-06.22
Paints	9-08
Timber and Lumber	9-09

6-04.3 Construction Requirements

6-04.3(1) Storing and Handling Material

At the Work site, the Contractor shall store all timber and lumber in piles. Weeds and rubbish under and around these piles shall have been removed before the lumber is stacked.

Untreated lumber shall be open stacked at least 12-inches above the ground. It shall be piled to shed water and prevent warping.

Treated timber shall be:

1. Cut, framed, and bored (whenever possible) before treatment;
2. Close stacked and piled to prevent warping;
3. Covered against the weather if the Engineer requires it;
4. Handled carefully to avoid sudden drops, broken outer fibers, and surface penetration or bruising with tools; and
5. Lifted and moved with rope or chain slings (without use of cant dogs, peaveys, hooks, or pike poles).

6-04.3(2) Workmanship

The Contractor shall employ only competent bridge carpenters. All their Work shall be true and exact. Nails and spikes shall be driven with just enough force to leave heads flush with wood surfaces. The Contractor shall discharge any worker who displays poor workmanship by leaving deep hammer marks in wood surfaces. Workmanship on metal parts shall comply with requirements for steel Structures.

6-04.3(3) Shop Details

The Contractor shall provide the Engineer with 6 sets of shop detail plans for all treated timber. These plans shall show dimensions for all cut, framed, or bored timbers. The Engineer will return to the Contractor 1 set of approved or corrected plans. No material shall be framed or bored until the Engineer approves the plans. Plans shall be drawn on sheets that conform to the sizes required in Section 1-05.3.

6-04.3(4) Field Treatment of Cut Surfaces, Bolt Holes, and Contact Surfaces

All cut surfaces, bolt holes, and contact surfaces shall be treated in accordance with Section 9-09.3 for all timber and lumber requiring preservative treatment.

All cuts and abrasions in treated piles or timbers shall be trimmed carefully and treated in accordance with Section 9-09.3.

6-04.3(5) Holes for Bolts, Dowels, Rods, and Lag Screws

Holes shall be bored:

1. For drift pins and dowels — with a bit $\frac{1}{16}$-inch smaller in diameter than the pins and dowels.
2. For truss rods or bolts — with a bit the same diameter as the rods or bolts.
3. For lag screws — in 2 parts: (a) with the shank lead hole the same diameter as the shank and as deep as the unthreaded shank is long; and (b) with the lead hole for the threaded part approximately ⅔ of the shank diameter.

6-04.3(6) Bolts, Washers, and Other Hardware

Bolts, dowels, washers, and other hardware, including nails, shall be black or galvanized as specified in the Plans, but if not so specified shall be galvanized when used in treated timber Structures.

Washers of the size and type specified shall be used under all bolt heads and nuts that would otherwise contact wood.

All bolts shall be checked by burring the threads after the nuts have been finally tightened. Vertical bolts shall have nuts on the lower ends.

Wherever bolts fasten timber to timber, to concrete, or to steel, the members shall be bolted tightly together at installation and retightened just before the Contracting Agency accepts the Work. These bolts shall have surplus threading of at least ⅜-inch per foot of timber thickness to permit future tightening.

6-04.3(7) Countersinking

Countersinking shall be done wherever smooth faces are required. Each recess shall be treated in accordance with Section 9-09.3.

6-04.3(8) Framing

The Contractor shall cut and frame lumber and timber to produce close-fitting, full-contact joints. Each mortise shall be true to size for its full depth, and its tenon shall fit it snugly. Neither shimmed nor open joints are permitted.

6-04.3(9) Framed Bents

Mudsills shall be of pressure-treated timber, firmly and evenly bedded to solid bearing, and tamped in place.

Concrete pedestals that support framed bents shall be finished so that sills will bear evenly on them. To anchor the sills, the Contractor shall set dowels in the pedestals when they are cast. The dowels shall be at least ¾-inch in diameter and protrude at least 6-inches above the pedestal tops. Pedestal concrete shall comply with Section 6-02.

Each sill shall rest squarely on mudsills, piles, or pedestals. It shall be drift-bolted to mudsills or piles with ¾-inch diameter or larger bolts that extend at least 6-inches into them. When possible, the Contractor shall remove any earth touching the sills to permit free air circulation around them.

Each post shall be fastened to sills with ¾-inch diameter or larger dowels that extend at least 6-inches into the post.

6-04.3(10) Caps

Timber caps shall rest uniformly across the tops of posts or piles and cap ends shall be aligned evenly. Each cap shall be fastened with a drift bolt ¾-inch in diameter or larger that penetrates the post or pile at least 9-inches. The bolt shall be approximately in the center of the pile or post.

If the Roadway grade exceeds 2-percent, each cap shall be beveled to match the grade.

6-04.3(11) Bracing

When pile bents are taller than 10-feet, each shall be braced transversely and every other pair shall be braced longitudinally. No single cross-bracing shall brace more than 20-feet of vertical distance on the piles. If the vertical distance exceeds 20-feet, more than 1 cross-bracing shall be used. Each brace end shall be bolted through the pile, post, or cap with a bolt ¾-inch in diameter or larger. Other brace/pile intersections shall be bolted or boat-spiked as the Plans require. Cross-bracing shall lap both upper or lower caps and shall be bolted to the caps or sills at each end.

6-04.3(12) Stringers

All stringers that carry laminated decking or vary more than ⅛-inch in depth shall be sized to an even depth at bearing points. Outside stringers shall be butt jointed and spliced. Interior stringers shall be lapped so that each rests over the full width of the cap or floorbeam at each end. Except on sharp horizontal and vertical curves, stringers may cover 2 spans. In this case, joints shall be staggered and the stringers either toenailed or drift bolted as the Plans require. To permit air circulation on untreated timber Structures, the ends of lapped stringers shall be separated. This separation shall be done by fastening across the lapping face a 1-inch by 3-inch wood strip cut 2-inches shorter than the depth of the stringer.

Any cross-bridging or solid bridging shall be neatly and accurately framed, then securely toenailed at each end (with 2 nails for cross-bridging and 4 nails for solid bridging). The Plans show bridging size and spacing.

6-04.3(13) Wheel Guards and Railings

Wheel guards and railings shall be built as Section 6-06.3(1) requires.

6-04.3(14) Single-Plank Floors

Single-plank floors shall be made of a single thickness of plank on stringers or joists. Unless the Engineer directs otherwise, the planks shall be:

1. Laid heart side down with tight joints,
2. Spiked to each joist or nailing strip with at least 2 spikes that are at least 4-inches longer than the plank thickness,
3. Spiked at least 2½-inches from the edges,
4. Cut off on a straight line parallel to the centerline of the Roadway,
5. Arranged so that no adjacent planks vary in thickness by no more than $\frac{1}{16}$-inch, and
6. Surfaced on 1 side and 1 edge (S1S1E) unless otherwise specified.

6-04.3(15) Laminated Floors

The strips shall be placed on edge and shall be drawn down tightly against the stringer or nailing strip and the adjacent strip and, while held in place, shall be spiked. Each strip shall extend the full width of the deck, unless some other arrangement is shown in the Plans or permitted by the Engineer.

Each strip shall be spiked to the adjacent strip at intervals of not more than 2-feet, the spikes being staggered 8-inches in adjacent strips. The spikes shall be of sufficient length to pass through 2 strips and at least halfway through the third. In addition, unless bolting is specified in the Plans, each strip shall be toenailed to alternate stringers with 40d common nails and adjacent strips shall be nailed to every alternate stringer. The ends of all pieces shall be toenailed to the outside stringer. The ends of the strips shall be cut off on a true line parallel to the centerline of the Roadway. When bolts are used to fasten laminated floors to stringers, the bolts shall be placed at the spacing shown in the Plans, and the pieces shall be drawn down tightly to the bolting strips. The bolt heads shall be driven flush with the surface of the deck. Double nuts or single nuts and lock nuts shall be used on all bolts. The strips shall be spiked together in the same manner as specified above.

6-04.3(16) Plank Subfloors for Concrete Decks

Any plank subfloor shall be laid surfaced side down with close joints at right angles to the centerline of the Roadway. Planks shall be spiked in place as required in Section 6-04.3(14).

Floor planks shall be treated in accordance with Section 9-09.3.

6-04.3(17) Trusses

Completed trusses shall show no irregularities of line. From end to end, chords shall be straight and true in horizontal projection. In vertical projection they shall show a smooth curve through panel points that conforms to the correct camber. The Engineer will reject any pieces cut unevenly or roughly at bearing points. Before placement of the hand railing, the Contractor shall complete all trusses, swing them free of their falsework, and adjust them for line and camber (unless the Engineer directs otherwise).

6-04.3(18) Painting

Section 6-07.3(3) governs painting of timber Structures.

6-04.4 Measurement

The criteria in Section 6-03.4 will be used to determine the weight of structural metal other than hardware.

Timber and lumber (treated or untreated) will be measured by the 1,000-board feet (MBM), using nominal thicknesses and widths. Lengths will be actual lengths of individual pieces in the finished Structure with no deduction for daps, cuts, or splices. To measure laminated timber decking, the Contracting Agency will use the number and after-dressing sizes of pieces required in the Plans. The length of each lamination shall be the length remaining in the finished Structure.

6-04.5 Payment

Payment will be made in accordance with Section 1-04.1, for each of the following Bid items that are included in the Proposal:

1. "Timber and Lumber (untreated or name treatment)", per MBM.
2. "Structural Metal", lump sum.

Where no item for structural metal is included in the Proposal, full pay for furnishing and placing metal parts shall be included in the unit Contract price per MBM for "Timber and Lumber".

When no Bid item is included in the Proposal and is not otherwise provided, painting shall be considered as incidental to the construction, and all costs therefore shall be included in the unit Contract prices for the payment items involved and shown.